

Work Order ID 89185

\*89185\*

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August-23-12 3:26:49 PM

Item ID: D412-664-203

Accept

\*N900040100\*

Setup Start \*NS1\*

Revision ID:

Stop \*NS2\*

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: MLJDate: 12/08/20

Tooling:

Date:

Run Start \*NR1\*

QC:

Date:

SPC (Y/N):

Date:

Stop \*NR2\*

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

Draw Nbr

Revision Nbr

D412-664-243

E/DEO

ESP

100

0.00

\*100\*

DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile and create labels as per PPP D412-664-203 CHG 008

DAS 18 12/10/12  
009 per ECN 12-643

110

0.00

\*110\*

Packaging

Packaging

Memo

0.00

Packaging

MO 12-9-25

120

0.00

\*120\*

BENDING MACHINE - CROSSTUBES

CNC Bend 2

Memo

0.00

CNC Alpha 160 Bender

Bend tube as per Dwg D412-664-243 using CNC bender program 412-aft and Folio FT010

MO/Em 12-9-26

NCR: Yes / No

## WORK ORDER NON-CONFORMANCE / UPDATE

DQA: But Date: 12/16/22QA Closed: OK Date:

|  |         |      |     |  |                   |  |             |              |              |  |  |
|--|---------|------|-----|--|-------------------|--|-------------|--------------|--------------|--|--|
| Work Order: <u>89185</u><br>Part No. <u>D412-664-203</u><br>NCR No. <u>12-1932</u> |         |      |     | <b>DISPOSITION</b><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input checked="" type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                   | <b>AGAINST DEPARTMENT/PROCESS</b><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input checked="" type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |             |              |              |  |  |
| Root Cause   | Date    | Step | Qty | Description of work order update or Non-conformance  | Initial Chief Eng | Action: Description  | Sign & Date | Verification | QC Inspector |  |  |
| Doc/Data   | 12/9/27 | 120  | 1   | CRUSHING FROM BENDING<br>IS OVER TOLERANCE.  | 12/9/27           | Acceptable per attached<br>S.R.  | 12/9/27     | 12/10/28     | 12/10/28     |  |  |
| Equip/Tooling  |         |      |     |  |                   |  |             |              |              |  |  |
| Operator   |         |      |     |  |                   |  |             |              |              |  |  |
| Material   |         |      |     |  |                   |  |             |              |              |  |  |
| Setup  |         |      |     |  |                   |  |             |              |              |  |  |
| Other  |         |      |     |  |                   |  |             |              |              |  |  |
| Process  |         |      |     |  |                   |  |             |              |              |  |  |
| Supplier   |         |      |     |  |                   |  |             |              |              |  |  |
| Training   |         |      |     |  |                   |  |             |              |              |  |  |
| Unapproved   |         |      |     |  |                   |  |             |              |              |  |  |

**FAULT CATEGORY**

|   |   |   |
|---|---|---|
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input checked="" type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions |
| <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge  |   |   |
| <input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><input type="checkbox"/> Other   |   |   |

# Work Order ID 89185

**\*89185\***

Page 2

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Item ID: D412-664-203

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

| Sequence ID/<br>Work Center ID | Operation<br>Description | Set Up/<br>Run Hours | Tool ID | Tool # | Plan<br>Code | Accept<br>Qty | Reject<br>Qty | Reject<br>Number | Insp.<br>Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

130 QC15- Crosstube Dimensional Check

0.00

**\*130\***

QC

Memo

0.00

Quality Control

140

0.00

**\*140\***

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Drill pilot holes in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551 and drill table DT8577 using #9 holes as per QSI 10 to install towers.

2-Ream hole to finish size in tube as per Dwg D412-664-243 using drill Jig DT8550 & DT8551. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-SCRIBE PART # & BATCH #

4- \*\*\* WEAR LATEX GLOVES WHEN HANDLING CROSTUBE\*\*\* Deburr & Inspect for surface damage. Repair damage within limits as per Dwg D412-664-243

RM 12-10-1

RM 12-10-5

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
|--|-------------|-------------|---|---|--------------------------|---|------------------------|---------------------|---|--|---|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____   |             |             |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                          | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                        |                     |   |  |   |  |
| <b>Root Cause</b>  | <b>Date</b> | <b>Step</b> | <b>Qty</b>  | <b>Description of work order update or Non-conformance</b>  | <b>Initial Chief Eng</b> | <b>Action Description</b>   | <b>Sign &amp; Date</b> | <b>Verification</b> | <b>QC Inspector</b>   |  |   |  |
| Doc/Data <input type="checkbox"/>  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Equip/Tooling <input type="checkbox"/>   |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Operator <input type="checkbox"/>  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Material <input type="checkbox"/>  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Setup <input type="checkbox"/>   |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Other <input type="checkbox"/>   |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Process <input type="checkbox"/>   |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Supplier <input type="checkbox"/>  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Training <input type="checkbox"/>  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| Unapproved <input type="checkbox"/>  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| <b>FAULT CATEGORY</b>  |             |             |   |   |                          |   |                        |                     |   |  |   |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |             |             | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                          | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |                        |                     | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge<br><hr/> <hr/> <hr/> |  | <input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><input type="checkbox"/> Other |  |

**Work Order ID 89185****\*89185\***

Page 3

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Item ID: D412-664-203

Accept

**\*N900040100\***Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

| Sequence ID/<br>Work Center ID | Operation<br>Description | Set Up/<br>Run Hours | Tool ID | Tool # | Plan<br>Code | Accept<br>Qty | Reject<br>Qty | Reject<br>Number | Insp.<br>Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

160

QC5- Inspect part completeness to step on W/O

0.00

**\*160\***

QC

Memo

0.00

Quality Control

\*\*\* WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE\*\*\*

170

0.00

**\*170\***

HandFXtube

Memo

0.00

Hand Finishing Crosstubes

\*\*\* WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE\*\*\*

1- CLEAN CROSSTUBE WITH WASH'N WIPE

180

Outsource process - NDT per QSI038 4.1

0.00

**\*180\***

Outsource2

Memo

0.00

Outsource process - NDT

\*\*\* WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE\*\*\*

Liquid Penetrant Inspection as per QSI 038Or  
Issue P/O: 1801 LPI as per ASTM 1417  
Level 2 Attach copy of NDT results to work order

CL 12/10/10 (1)

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|   |      |      |   |   |                   |   |             |              |   |  |  |
|---|------|------|---|---|-------------------|---|-------------|--------------|---|--|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____  |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                   | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |             |              |   |  |  |
| <b>Root Cause</b>   | Date | Step | Qty   | Description of work order update or Non-conformance   | Initial Chief Eng | Action Description  | Sign & Date | Verification | QC Inspector  |  |  |
| Doc/Data <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |   |  |  |
| Equip/Tooling <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |   |  |  |
| Operator <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |   |  |  |
| Material <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |   |  |  |
| Setup <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |   |  |  |
| Other <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |   |  |  |
| Process <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |   |  |  |
| Supplier <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |   |  |  |
| Training <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |   |  |  |
| Unapproved <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |   |  |  |
| <b>FAULT CATEGORY</b>   |      |      |   |   |                   |   |             |              |   |  |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                   | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |             |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge<br><br><input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><br><input type="checkbox"/> Other |  |  |

# Work Order ID 89185

**\*89185\***

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Item ID: D412-664-203

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

| Sequence ID/<br>Work Center ID | Operation<br>Description  | Set Up/<br>Run Hours | Tool ID | Tool # | Plan<br>Code | Accept<br>Qty | Reject<br>Qty | Reject<br>Number | Insp.<br>Stamp |
|--------------------------------|---|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
| 190                            | Packaging   | 0.00                 |         |        |              |               |               |                  |                |
| <b>*190*</b>                   |   |                      |         |        |              |               |               |                  |                |
| Packaging                      | Memo  | 0.00                 |         |        |              |               |               |                  |                |
| Packaging                      | *** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***  |                      |         |        |              |               |               |                  |                |
|                                | Inspect for transit damage  |                      |         |        |              |               |               |                  |                |
|                                | Ensure copy of NDT results attached to work order.                                      |                      |         |        |              |               |               |                  |                |
| 200                            | QC5- Inspect part completeness to step on W/O   | 0.00                 |         |        |              |               |               |                  |                |
| <b>*200*</b>                   |   |                      |         |        |              |               |               |                  |                |
| QC                             | Memo  | 0.00                 |         |        |              |               |               |                  |                |
| Quality Control                | *** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***  |                      |         |        |              |               |               |                  |                |
|                                | Inspect for damage & ensure results are as per Dwg D412-664-203                         |                      |         |        |              |               |               |                  |                |
| 203                            |   | 0.00                 |         |        |              |               |               |                  |                |
| <b>*203*</b>                   |   |                      |         |        |              |               |               |                  |                |
| HandFXtube                     | Memo  | 0.00                 |         |        |              |               |               |                  |                |
| Hand Finishing Crosstubes      | *** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***  |                      |         |        |              |               |               |                  |                |
|                                | 1- PRESSURE WASH AND THEN USE WASH'N WIPE TO CLEAN CROSSTUBE BEFORE CHEMICAL CONVERSION |                      |         |        |              |               |               |                  |                |

*[Handwritten signature]*

DAS  
05  
9-89 12-10-10

*RM 12-10-10*

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |      |      |   |   |                      |   |                |              |  |  |   |  |
|--|------|------|---|---|----------------------|---|----------------|--------------|--|--|---|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____   |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                |              |  |  |   |  |
| <b>Root Cause</b>  | Date | Step | Qty   | Description of work order update<br>or Non-conformance  | Initial<br>Chief Eng | Action<br>Description   | Sign &<br>Date | Verification | QC Inspector   |  |   |  |
| Doc/Data <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Equip/Tooling <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Operator <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Material <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Setup <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Other <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Process <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Supplier <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Training <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Unapproved <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| <b>FAULT CATEGORY</b>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                      | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |                |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge |  | <input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><input type="checkbox"/> Other |  |



**Work Order ID 89185****\*89185\***

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Item ID: D412-664-203

Accept

**\*N900040100\***Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

| Sequence ID/<br>Work Center ID | Operation<br>Description | Set Up/<br>Run Hours | Tool ID | Tool # | Plan<br>Code | Accept<br>Qty | Reject<br>Qty | Reject<br>Number | Insp.<br>Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

205

QC7-Inspect Chemical Conversion Coat

0.00

**\*205\***

QC

Memo

0.00

Quality Control

\*\*\* WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE\*\*\*

DAS  
05  
9-09 12-10-10

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |   |   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
|--|---|---|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|----------------------------------|--|------------------------------------|--|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____ | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table> | Skid-tube <input type="checkbox"/>   | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> |  |
| Skid-tube <input type="checkbox"/>                           | Crosstube <input type="checkbox"/>  | Water Jet <input type="checkbox"/>  | Engineering <input type="checkbox"/> |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Machining <input type="checkbox"/>                           | Small Fab <input type="checkbox"/>  | Prod. Eng. Coord. <input type="checkbox"/>  | Quality <input type="checkbox"/>     |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Thermoforming <input type="checkbox"/>                       | Finishing <input type="checkbox"/>  | Rec/Store/Packaging <input type="checkbox"/>  | Other <input type="checkbox"/>       |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Large Fab <input type="checkbox"/>                           | Composite <input type="checkbox"/>  | Supplier <input type="checkbox"/>   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |

| Root Cause    | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector |
|---------------|------|------|-----|---|-------------------|--------------------|-------------|--------------|--------------|
| Doc/Data      |      |      |     |   |                   |                    |             |              |              |
| Equip/Tooling |      |      |     |   |                   |                    |             |              |              |
| Operator      |      |      |     |   |                   |                    |             |              |              |
| Material      |      |      |     |   |                   |                    |             |              |              |
| Setup         |      |      |     |   |                   |                    |             |              |              |
| Other         |      |      |     |   |                   |                    |             |              |              |
| Process       |      |      |     |   |                   |                    |             |              |              |
| Supplier      |      |      |     |   |                   |                    |             |              |              |
| Training      |      |      |     |   |                   |                    |             |              |              |
| Unapproved    |      |      |     |   |                   |                    |             |              |              |

**FAULT CATEGORY**

| Landing Gear  | General                                 | Other  |
|---|---|--|
| <input type="checkbox"/> Bending                      | <input type="checkbox"/> Bend           | <input type="checkbox"/> Grain                           |
| <input type="checkbox"/> Centre Not Concentric to O/S | <input type="checkbox"/> BOM/Route      | <input type="checkbox"/> Hardware                        |
| <input type="checkbox"/> Cracks                       | <input type="checkbox"/> Broken/Damaged | <input type="checkbox"/> Inspection Incomplete           |
| <input type="checkbox"/> Crushed/Crimped.             | <input type="checkbox"/> Burrs          | <input type="checkbox"/> Instructions Incomplete/Unclear |
| <input type="checkbox"/> Cuffs                        | <input type="checkbox"/> Contamination  | <input type="checkbox"/> Maintenance                     |
| <input type="checkbox"/> Heat Treat                   | <input type="checkbox"/> Countersink    | <input type="checkbox"/> Mislabeled                      |
| <input type="checkbox"/> Inspection Strip in Tube     | <input type="checkbox"/> Cut Too Short  | <input type="checkbox"/> Misread                         |
| <input type="checkbox"/> Ripples in Bend              | <input type="checkbox"/> Drill Holes    | <input type="checkbox"/> Offset                          |
| <input type="checkbox"/> Torque Waves in Extrusion    | <input type="checkbox"/> Drawing        | <input type="checkbox"/> Out of Calibration              |
| <input type="checkbox"/> Turning Sequence             | <input type="checkbox"/> Finish         | <input type="checkbox"/> Out of Sequence                 |
| <input type="checkbox"/> Wave/Twist in Tube           | <input type="checkbox"/> Folio          | <input type="checkbox"/> Outside Dimensions              |
|   |   | <input type="checkbox"/> Ovalized                        |
|   |   | <input type="checkbox"/> Over/Under tolerance            |
|   |   | <input type="checkbox"/> Part Incorrect                  |
|   |   | <input type="checkbox"/> Part Lost/Missing               |
|   |   | <input type="checkbox"/> Part Moved                      |
|   |   | <input type="checkbox"/> Positioned Wrong                |
|   |   | <input type="checkbox"/> Power Loss/Surge                |
|   |   | <input type="checkbox"/> Pressure/Forced                 |
|   |   | <input type="checkbox"/> Temperature/Cure                |
|   |   | <input type="checkbox"/> Weld                            |
|   |   | <input type="checkbox"/> Wrong Stock Pulled              |
|   |   | <input type="checkbox"/> Other                           |

# Work Order ID 89185

**\*89185\***

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August-23-12 3:26:49 PM

Item ID: D412-664-203

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

| Sequence ID/<br>Work Center ID | Operation<br>Description   | Set Up/<br>Run Hours | Tool ID | Tool # | Plan<br>Code | Accept<br>Qty | Reject<br>Qty | Reject<br>Number | Insp.<br>Stamp |
|--------------------------------|--|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
| 210                            | SprayPaint   | 0.00                 |         |        |              |               |               |                  |                |
| <b>*210*</b>                   |  |                      |         |        |              |               |               |                  |                |
| SprayPaint                     | Memo   | 0.00                 |         |        |              |               |               |                  |                |
| Spray Painting                 | *** WEAR LATEX GLOVES WHEN HANDLING CROSSTUBE***                                   |                      |         |        |              |               |               |                  |                |
|                                | ***Mask underside of crosstube as shown***   |                      |         |        |              |               |               |                  |                |
|                                | 1-Prime inside and outside crosstube as per QSI 005 4.2                            |                      |         |        |              |               |               |                  |                |
|                                | 2-Paint outside crosstube with White Imron as per DEO D412-664-243 and QSI 005 4.2 |                      |         |        |              |               |               |                  |                |
|                                | Clear 122638   |                      |         |        |              |               |               |                  |                |
|                                | PRIME: 122888  |                      |         |        |              |               |               |                  |                |
|                                | Start Time: 10:00  |                      |         |        |              |               |               |                  |                |
|                                | Finish Time: 10:45   |                      |         |        |              |               |               |                  |                |
|                                | PAINT: 123003  |                      |         |        |              |               |               |                  |                |
|                                | Start Time: 7:00   |                      |         |        |              |               |               |                  |                |
|                                | Finish Time: 7:45  |                      |         |        |              |               |               |                  |                |
|                                | 3- Apply clear coat after paint as per DEO   |                      |         |        |              |               |               |                  |                |

12-10-12

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |      |      |   |   |                   |   |             |              |  |  |   |  |
|--|------|------|---|---|-------------------|---|-------------|--------------|--|--|---|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____   |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                   | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |             |              |  |  |   |  |
| <b>Root Cause</b>  | Date | Step | Qty   | Description of work order update or Non-conformance   | Initial Chief Eng | Action Description  | Sign & Date | Verification | QC Inspector   |  |   |  |
| Doc/Data <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |  |  |   |  |
| Equip/Tooling <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |  |  |   |  |
| Operator <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |  |  |   |  |
| Material <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |  |  |   |  |
| Setup <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |  |  |   |  |
| Other <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |  |  |   |  |
| Process <input type="checkbox"/>   |      |      |   |   |                   |   |             |              |  |  |   |  |
| Supplier <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |  |  |   |  |
| Training <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |  |  |   |  |
| Unapproved <input type="checkbox"/>  |      |      |   |   |                   |   |             |              |  |  |   |  |
| <b>FAULT CATEGORY</b>  |      |      |   |   |                   |   |             |              |  |  |   |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                   | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |             |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge |  | <input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><br><input type="checkbox"/> Other |  |

# Work Order ID 89185

**\*89185\***

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August-23-12 3:26:49 PM

Item ID: D412-664-203

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Approvals: Process Plan: Date: Tooling: Date:

Run Start **\*NR1\***

QC: Date: SPC (Y/N): Date:

Stop **\*NR2\***

| Sequence ID/<br>Work Center ID | Operation<br>Description  | Set Up/<br>Run Hours | Tool ID | Tool # | Plan<br>Code | Accept<br>Qty | Reject<br>Qty | Reject<br>Number | Insp.<br>Stamp |
|--------------------------------|---|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
| 220                            | QC14- Inspect Spray Paint   | 0.00                 |         |        |              | 1             |               |                  | 12.10.13       |
| <b>*220*</b>                   |   |                      |         |        |              |               |               |                  |                |
| QC                             | Memo  | 0.00                 |         |        |              |               |               |                  |                |
| Quality Control                | Then, Wrap in plastic bag to protect from scratches   |                      |         |        |              |               |               |                  |                |
| 230                            |   | 0.00                 |         |        |              |               |               |                  |                |
| <b>*230*</b>                   |   |                      |         |        |              |               |               |                  |                |
| Crosstubes                     | Crosstubes  | 0.00                 |         |        |              |               |               |                  | 12.10.14       |
| Crosstubes                     | Memo  | 0.00                 |         |        |              |               |               |                  |                |
| Crosstubes                     | Assemble as per Dwg D412-664-203  |                      |         |        |              |               |               |                  |                |
|                                | 1- Install chafing shield as per DEO D412-664-243. Top holes should be facing up.   |                      |         |        |              |               |               |                  |                |
|                                | A/R Proseal 890 Batch: <u>123103</u>  |                      |         |        |              |               |               |                  |                |
|                                | EXP: <u>03/13</u>   |                      |         |        |              |               |               |                  |                |
|                                | 2- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe  |                      |         |        |              |               |               |                  |                |
|                                | 3- Install support with Scotch-Weld DP460 and install clamps as per DEO Dwg D12-664-243 using installaiton jig DT9024. Torque clamps as per dwg |                      |         |        |              |               |               |                  |                |
|                                | A/R Scotch-Weld DP460 Batch: <u>121368</u>  |                      |         |        |              |               |               |                  |                |
|                                | EXP: <u>13-4-13</u>   |                      |         |        |              |               |               |                  |                |

chafing shield see DEO attached for placement  
Rev. C per EWN 12/03

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|   |      |      |   |   |                      |   |                |              |  |  |   |  |
|---|------|------|---|---|----------------------|---|----------------|--------------|--|--|---|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____  |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                |              |  |  |   |  |
| <b>Root Cause</b>   | Date | Step | Qty   | Description of work order update<br>or Non-conformance  | Initial<br>Chief Eng | Action<br>Description   | Sign &<br>Date | Verification | QC Inspector   |  |   |  |
| Doc/Data <input type="checkbox"/>   |      |      |   |   | 24/1<br>31<br>12     |   |                |              |  |  |   |  |
| Equip/Tooling <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Operator <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Material <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Setup <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Other <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Process <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Supplier <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Training <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Unapproved <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| <b>FAULT CATEGORY</b>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                      | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |                |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge |  | <input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><input type="checkbox"/> Other |  |

**Work Order ID 89185****\*89185\***

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August-23-12 3:26:49 PM

Item ID: D412-664-203

Accept

**\*N900040100\***Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Aft

Start Date: 9/04/12 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 9/04/12 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

| Sequence ID/<br>Work Center ID | Operation<br>Description | Set Up/<br>Run Hours | Tool ID | Tool # | Plan<br>Code | Accept<br>Qty | Reject<br>Qty | Reject<br>Number | Insp.<br>Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

270

0.00

**\*270\***

Packaging

Packaging

Memo

0.00

Packaging

Identify and pack for shipping as per PPP D412-664-203

\*\*\*\*\*Ensure tube is not packaged if curing time is less than 12 hrs, see step 27

for application time &amp; date \*\*\*\*\*

Time & date of packaging: 10/6/30 BookLocation: 103SL 12/10/18 SP

280

QC21- Final Inspection - Work Order Release

0.00

**\*280\***

QC

Memo

0.00

Quality Control

12/10/19W 12.10.18

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |      |      |   |   |                      |   |                |              |   |  |  |
|--|------|------|---|---|----------------------|---|----------------|--------------|---|--|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____   |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                |              |   |  |  |
| <b>Root Cause</b>  | Date | Step | Qty   | Description of work order update<br>or Non-conformance  | Initial<br>Chief Eng | Action<br>Description   | Sign &<br>Date | Verification | QC Inspector  |  |  |
| Doc/Data <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Equip/Tooling <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Operator <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Material <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Setup <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Other <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Process <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Supplier <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Training <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Unapproved <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| <b>FAULT CATEGORY</b>  |      |      |   |   |                      |   |                |              |   |  |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                      | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |                |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge<br><br><input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><br><input type="checkbox"/> Other |  |  |



# Picklist Print

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Page 1

Work Order ID: 89185  
Parent Item: D412-664-203  
Parent Item Name: Crosstube Aft

Start Date: 9/04/12  
Start Qty: 1.00

Required Date: 9/04/12  
Required Qty: 1.00

Comments: IPP Rev:E04.02.16Reformat; Added D3189-1K/DS  
IPP Rev:F 06-03-29 Remove Coments on Pick List JLM  
IPP Rev:G 06.12.08 per ECN 886 EC  
IPP Rev:H 07-04-30 As per Rev D JLM  
IPP Rev:I 08-06-12 add comment in seq. 21 DD verified by:EC IPP rev J 11.04.21 DEO D412-664-243-E-1 EC verified DD IPP REV:K 11.10.03 DEO D412-664-243-E-2 DD verf:EC

| Component Item ID/<br>Item Name | Replacement<br>Item ID | Mfg/<br>Purch | Bin<br>Item | Primary<br>Location | Last<br>Location | Route<br>Seq ID | Unit of<br>Measure | Qty on<br>Hand  | Qty per Kit | Total<br>Qty | Qty<br>Issued | Date<br>Issued | Status |
|---------------------------------|------------------------|---------------|-------------|---------------------|------------------|-----------------|--------------------|-----------------|-------------|--------------|---------------|----------------|--------|
| AN6-40A<br>Bolt                 |                        | Purchased     | No          |                     |                  | 250             | Each               | 122.0000        | 4           | 4            |               |                |        |
|                                 |                        |               |             | <u>Location</u>     |                  | <u>Loc Qty</u>  |                    | <u>Loc Code</u> |             |              |               |                |        |
|                                 |                        |               |             | ST340               |                  | 50              |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 122416              |                  | 50              |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | ST342               |                  | 72              |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | <del>120187</del>   |                  | 66              |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 120833              |                  | 4               |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 121827              |                  | 2               |                    |                 |             |              |               |                |        |
| AN6-41A<br>Bolt                 |                        | Purchased     | No          |                     |                  | 250             | Each               | 89.0000         | 2           | 2            |               |                |        |
|                                 |                        |               |             | <u>Location</u>     |                  | <u>Loc Qty</u>  |                    | <u>Loc Code</u> |             |              |               |                |        |
|                                 |                        |               |             | ST340               |                  | 50              |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 122407              |                  | 50              |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | ST342               |                  | 39              |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 120423              |                  | 9               |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 121825              |                  | 30              |                    |                 |             |              |               |                |        |
| AN960JD616<br>Washer            | NAS1149D0663J          | Purchased     | No          |                     |                  | 250             | Each               | 0.0000          | 18          | 18           |               |                |        |
| D2896-1<br>Support              |                        | Manufactured  | No          |                     |                  | 230             | Each               | 14.0000         | 1           | 1            |               |                |        |
|                                 |                        |               |             | <u>Location</u>     |                  | <u>Loc Qty</u>  |                    | <u>Loc Code</u> |             |              |               |                |        |
|                                 |                        |               |             | LG052               |                  | 6               |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 80586               |                  | 6               |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | LG053               |                  | 8               |                    |                 |             |              |               |                |        |
|                                 |                        |               |             | 74465               |                  | 8               |                    |                 |             |              |               |                |        |

84 88695

18 18  
m 123021  
SP12-10-16  
12-10-14

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |      |      |   |   |                      |   |                |              |   |  |  |  |
|--|------|------|---|---|----------------------|---|----------------|--------------|---|--|--|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____   |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                |              |   |  |  |  |
| <b>Root Cause</b>  | Date | Step | Qty   | Description of work order update<br>or Non-conformance  | Initial<br>Chief Eng | Action<br>Description   | Sign &<br>Date | Verification | QC Inspector  |  |  |  |
| Doc/Data <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |  |
| Equip/Tooling <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |  |
| Operator <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |  |
| Material <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |  |
| Setup <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |  |
| Other <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |  |
| Process <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |  |
| Supplier <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |  |
| Training <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |  |
| Unapproved <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |  |
| <b>FAULT CATEGORY</b>  |      |      |   |   |                      |   |                |              |   |  |  |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                      | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |                |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge<br><br>_____<br>_____<br>_____ |  | <input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><br><input type="checkbox"/> Other<br><br>_____<br>_____<br>_____ |  |

# Picklist Print

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Page 2

Work Order ID: 89185

Parent Item: D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 9/04/12

Required Date: 9/04/12

Start Qty: 1.00

Required Qty: 1.00

D3189-1  
Chafing Shield

Manufactured No

230 Each 43.0000 2 2

12.10.14

Location Loc Qty Loc Code

|       |    |  |
|-------|----|--|
| FG    | 4  |  |
| 36065 | 4  |  |
| LG052 | 26 |  |
| 86652 | 26 |  |
| LG053 | 13 |  |
| 85515 | 11 |  |
| 89028 | 2  |  |

89804

D3595-063-570  
RUBBER CUSHION

Manufactured No

230 Each 131.0000 2 2

12.10.14

Location Loc Qty Loc Code

|        |    |  |
|--------|----|--|
| FG     | 8  |  |
| 37971  | 1  |  |
| 42243  | 7  |  |
| LG     | 78 |  |
| 83294  | 78 |  |
| MAT052 | 45 |  |
| 71534  | 1  |  |
| 76546  | 44 |  |

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Shop Packet Print

Page 2

NCR: Yes / No

## WORK ORDER NON-CONFORMANCE / UPDATE

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |   |   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
|--|---|---|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|----------------------------------|--|------------------------------------|--|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____ | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table> | Skid-tube <input type="checkbox"/>   | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> |  |
| Skid-tube <input type="checkbox"/>                           | Crosstube <input type="checkbox"/>  | Water Jet <input type="checkbox"/>  | Engineering <input type="checkbox"/> |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Machining <input type="checkbox"/>                           | Small Fab <input type="checkbox"/>  | Prod. Eng. Coord. <input type="checkbox"/>  | Quality <input type="checkbox"/>     |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Thermoforming <input type="checkbox"/>                       | Finishing <input type="checkbox"/>  | Rec/Store/Packaging <input type="checkbox"/>  | Other <input type="checkbox"/>       |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Large Fab <input type="checkbox"/>                           | Composite <input type="checkbox"/>  | Supplier <input type="checkbox"/>   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |

| Root Cause                             | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector |
|--|------|------|-----|---|-------------------|--------------------|-------------|--------------|--------------|
| Doc/Data <input type="checkbox"/>      |      |      |     |   |                   |                    |             |              |              |
| Equip/Tooling <input type="checkbox"/> |      |      |     |   |                   |                    |             |              |              |
| Operator <input type="checkbox"/>      |      |      |     |   |                   |                    |             |              |              |
| Material <input type="checkbox"/>      |      |      |     |   |                   |                    |             |              |              |
| Setup <input type="checkbox"/>         |      |      |     |   |                   |                    |             |              |              |
| Other <input type="checkbox"/>         |      |      |     |   |                   |                    |             |              |              |
| Process <input type="checkbox"/>       |      |      |     |   |                   |                    |             |              |              |
| Supplier <input type="checkbox"/>      |      |      |     |   |                   |                    |             |              |              |
| Training <input type="checkbox"/>      |      |      |     |   |                   |                    |             |              |              |
| Unapproved <input type="checkbox"/>    |      |      |     |   |                   |                    |             |              |              |

### FAULT CATEGORY

|   |   |  |
|---|---|--|
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions<br><br><input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge<br><br><input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><input type="checkbox"/> Other |
|---|---|--|

# Picklist Print

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Page 4

Work Order ID: 89185

Parent Item: D412-664-203

Parent Item Name: Crosstube Aft

Start Date: 9/04/12

Required Date: 9/04/12

Start Qty: 1.00

Required Qty: 1.00

MS21920-28

Purchased

No

230

Each

78.0000

4

4

Clamp(per MIL-DTL-8783C)

*12-10-14*

Location

Loc Qty

Loc Code

FG

5

105884

5

LG050

55

118713

3

120054

2

122518

50

LG051

18

121440

8

122204

10

*B# 122838*

MS21920-30

Purchased

No

230

Each

79.0000

2

2

clamp(per MIL-DTL-8783C)

*12-10-14*

Location

Loc Qty

Loc Code

LG

16

119529

16

LG051

63

111258

14

121583

49

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Shop Packet Print

Page 4

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

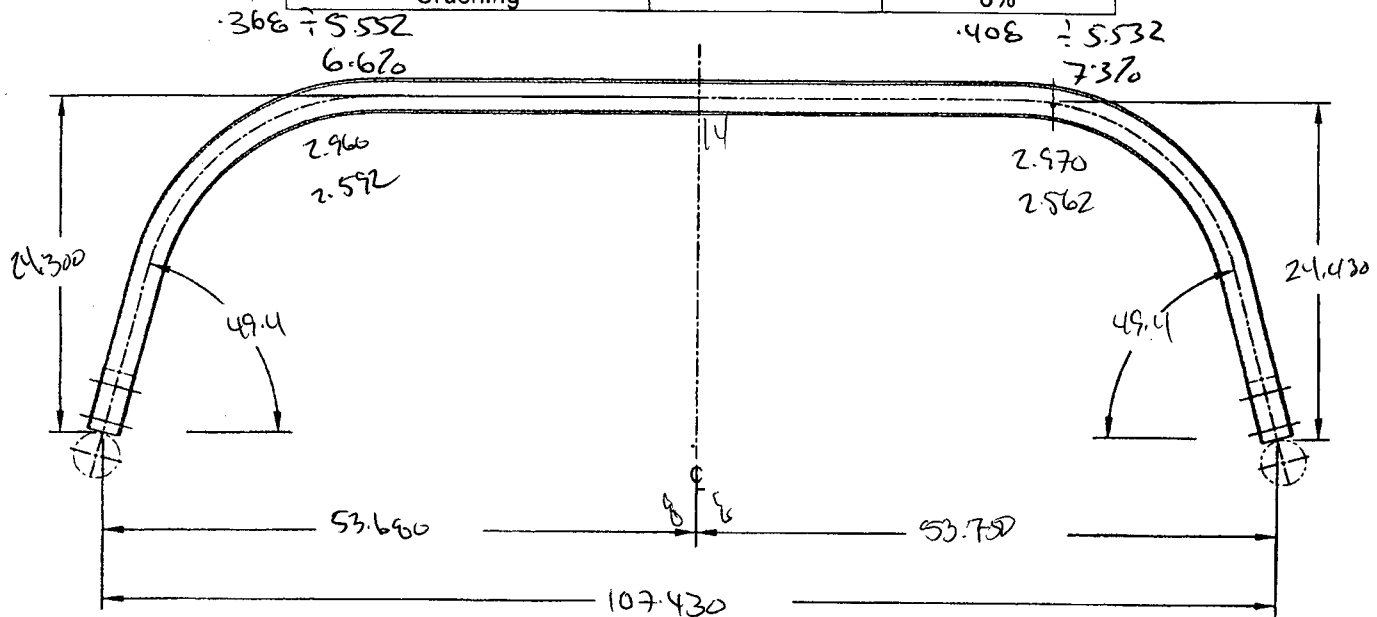
DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |      |      |   |   |                      |   |                |              |  |  |   |  |
|--|------|------|---|---|----------------------|---|----------------|--------------|--|--|---|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____   |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                |              |  |  |   |  |
| <b>Root Cause</b>  | Date | Step | Qty   | Description of work order update<br>or Non-conformance  | Initial<br>Chief Eng | Action<br>Description   | Sign &<br>Date | Verification | QC Inspector   |  |   |  |
| Doc/Data <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Equip/Tooling <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Operator <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Material <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Setup <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Other <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Process <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |  |  |   |  |
| Supplier <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Training <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| Unapproved <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| <b>FAULT CATEGORY</b>  |      |      |   |   |                      |   |                |              |  |  |   |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                      | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |                |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge |  | <input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><br><input type="checkbox"/> Other |  |

|   |  |                     |              |
|---|--|---------------------|--------------|
| <b>DART AEROSPACE LTD</b>                         |  | <b>Work Order:</b>  | 89185        |
| <b>Description:</b> Crosstube High Aft (412)      |  | <b>Part Number:</b> | D412-664-203 |
| <b>Inspection Dwg:</b> D412-664-243 <b>Rev:</b> E |  | <b>Page 1 of 1</b>  |              |

| Required Dimension | Min    | Max    |
|--------------------|--------|--------|
| Height             | 24.24  | 24.50  |
| 1/2 Span           | 53.59  | 53.85  |
| Angle              | 49     | 52     |
| Total Span         | 107.18 | 107.70 |
| Bending Passes     | 8      | --     |
| Crushing           | --     | 6%     |



|                           | Side A | middle | Side B |
|---------------------------|--------|--------|--------|
| <b>Bending Passes</b>     | 8      | 14     | 8      |
| <b>Crushing</b>           | 6.670  |        | 7.370  |
| <b>Comments</b>           |        |        |        |
| Side A = 6.670 @ 8 Passes |        |        |        |
| Middle = 14 Passes        |        |        |        |
| Side B = 7.370 @ 8 Passes |        |        |        |

|                 |          |
|-----------------|----------|
| QC15 Inspection | 16       |
| Date            | 17/09/28 |

| Rev | Date     | Change                             | Revised by | Approved |
|-----|----------|------------------------------------|------------|----------|
| A   | 07.02.06 | New Issue                          | KJ/JM      |          |
| B   | 07.05.08 | Dimensions updated per Dwg rev. D  | KJ/JLM     |          |
| C   | 10.02.02 | Dwg Rev updated                    | KJ         |          |
| D   | 12.04.16 | Added bending, crushing dimensions | KJ         |          |

| Item | Qty  | Part Number    | Description   |
|------|------|----------------|---|
|      | -243 |                |   |
| 1    | X    | D412-664-243   | CROSSTUBE ASSEMBLY (412 HIGH AFT)   |
| 2    | 1    | D6009-129      | CROSSTUBE   |
| 3    | 2    | D3595-063-570  | RUBBER CUSHION  |
| 4    | 1    | D2896-1        | SUPPORT   |
| 5    | 2    | D3189-1        | CHAFING SHIELD  |
| 6    | 2    | D2856-600-1009 | ABRASION STRIP  |
| 7    | 4    | MS21920-28     | CLAMP   |
| 8    | 2    | MS21920-30     | CLAMP (OR MS21920-32)   |
| 9    | A/R  | MAGNOBOND 6398 | ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE) |

# **GENERAL NOTES:**

- 1) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING/TRIMMING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: SCRIBE DART PART NUMBER "D412-664-243" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- 7) WEIGHT: 47.0 lbs (PER IIN-D212-664)
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 13) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT.
- 14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 15) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

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WITHOUT NOTICE

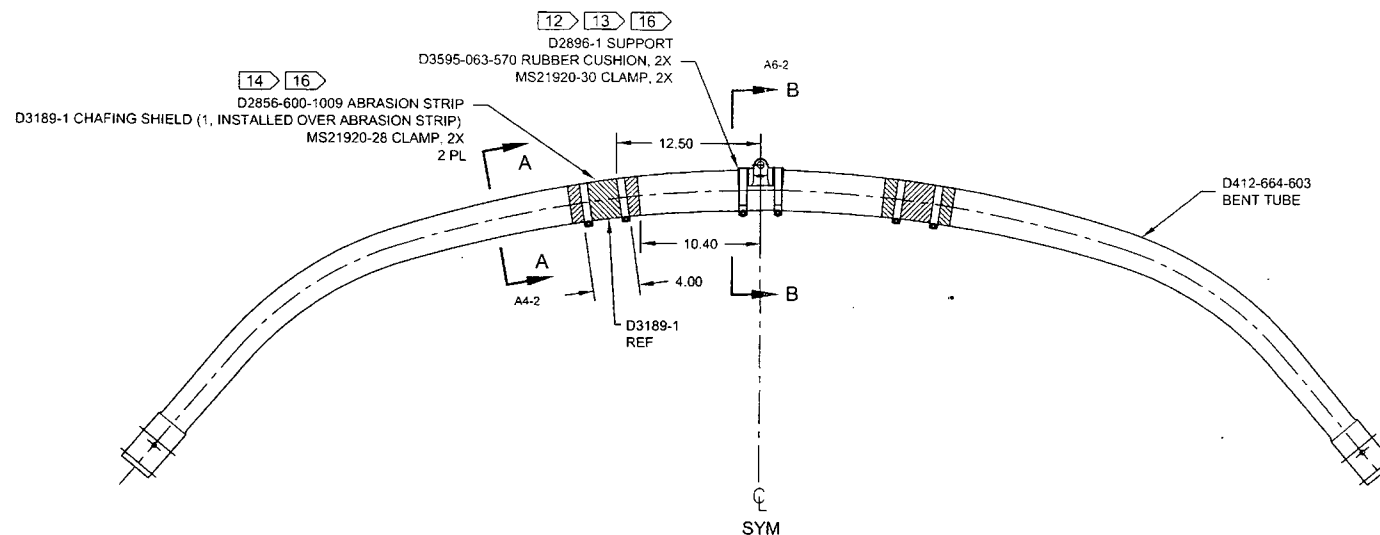
WORK ORDER  
NO. 89185 ML5  
12/08/28

② DEO ATTACHED

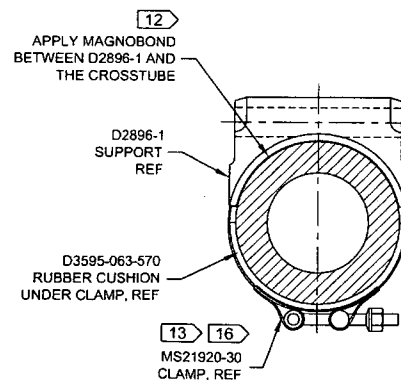
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2009-10-29

|            |   |   |              |
|------------|---|---|--------------|
| E          | REFORMAT/REVISE GENERAL NOTES; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4. | RF  | 09.09.30     |
| D          | REMOVE D2732-058, CHANGE TO D3595-063-570   | PH  | 07.03.09     |
| C          | REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398. MS21920-32 WAS MS21920-30  | MB  | 06.10.27     |
| B          | ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES   | PH  | 05.02.04     |
| A          | NEW ISSUE   | PH  | 01.10.17     |
| REV.       | DESCRIPTION   | BY  | DATE         |
| DESIGN     | PH  | <b>DART AEROSPACE LTD</b><br>HAWKESBURY, ONTARIO, CANADA  |              |
| DRAWN      | RF  |   |              |
| CHECKED    | PH  | DRAWING NO.   | REV. E       |
| MFG. APPR. | PH  | D412-664-243  | SHEET 1 OF 4 |
| APPROVED   | PH  | TITLE   | SCALE        |
| DE APPR.   | PH  | CROSSTUBE ASSEMBLY (412 HI AFT)   | NTS          |
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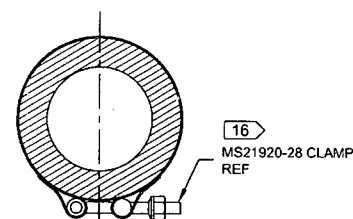




**D212-664-243**  
**ASSEMBLY DETAIL**



**SECTION B-B** D4-2  
SCALE 4X

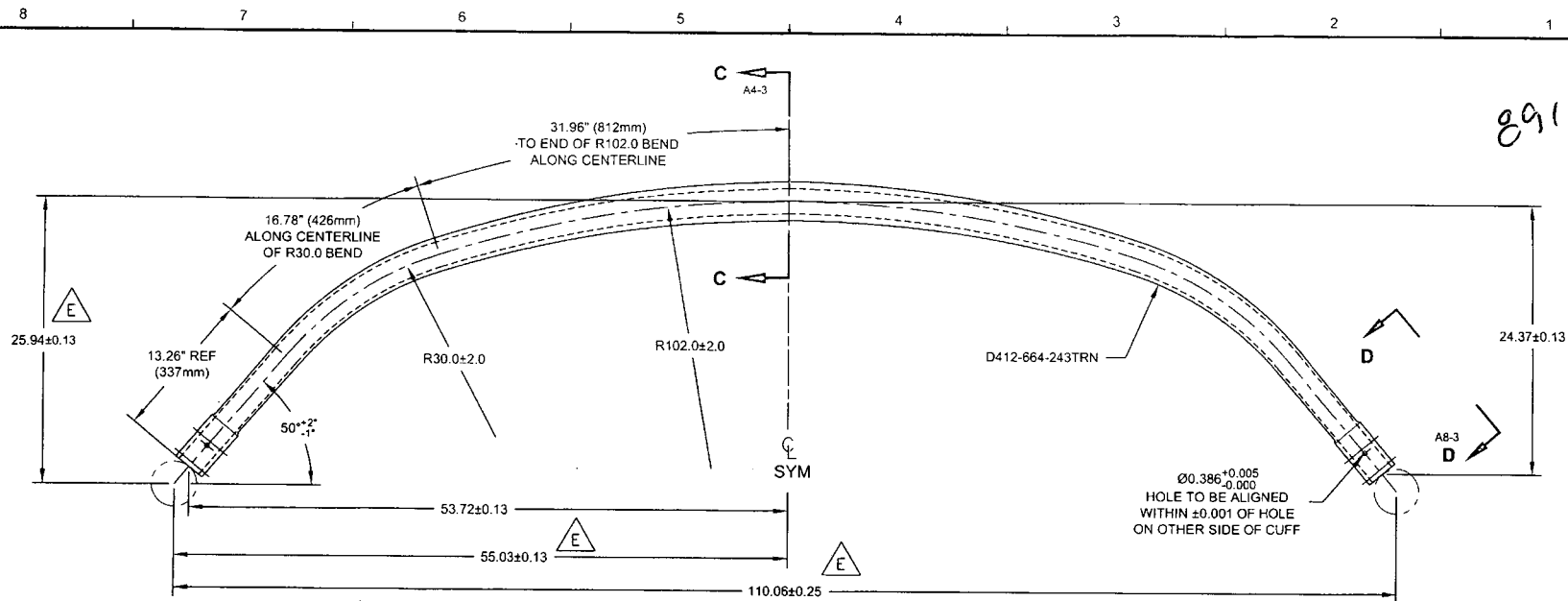


**SECTION A-A** C6-2  
SCALE 4X

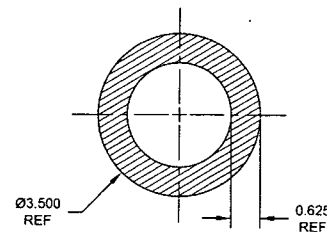
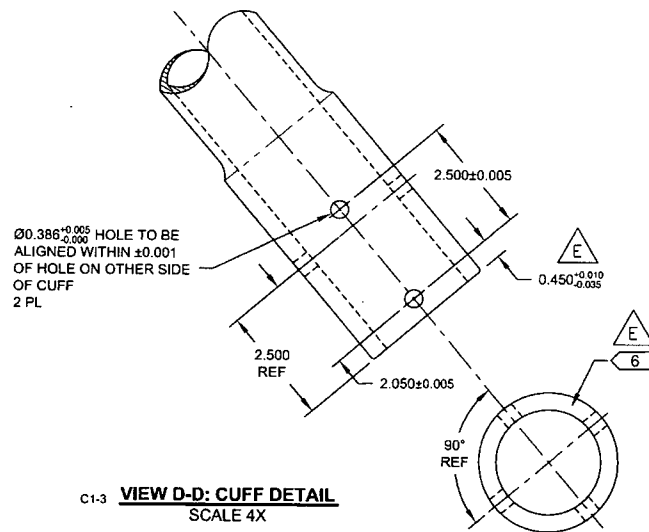
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**RELEASED**  
2009-10-29  
NMP

|            |          |  |              |
|------------|----------|--|--------------|
| DESIGN     | PH       | <b>DART AEROSPACE LTD</b>  |              |
| DRAWN      | RF       | HAWKESBURY, ONTARIO, CANADA  |              |
| CHECKED    | Q        | DRAWING NO.  | REV. E       |
| MFG. APPR. | S        | D412-664-243   | SHEET 2 OF 4 |
| APPROVED   | AP       | TITLE  | SCALE        |
| DE APPR.   | AP       | CROSSTUBE ASSEMBLY (412 HI AFT)  | NTS          |
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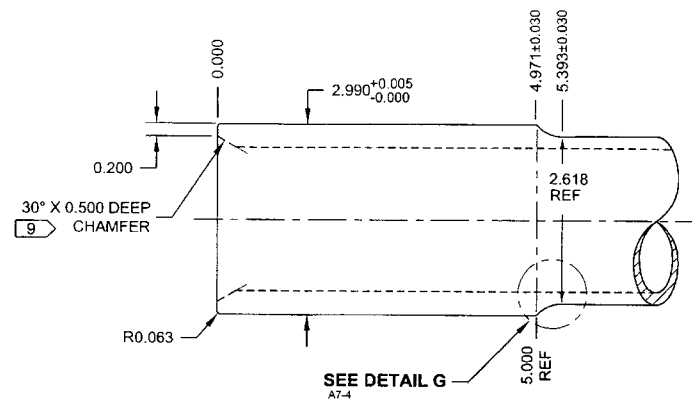
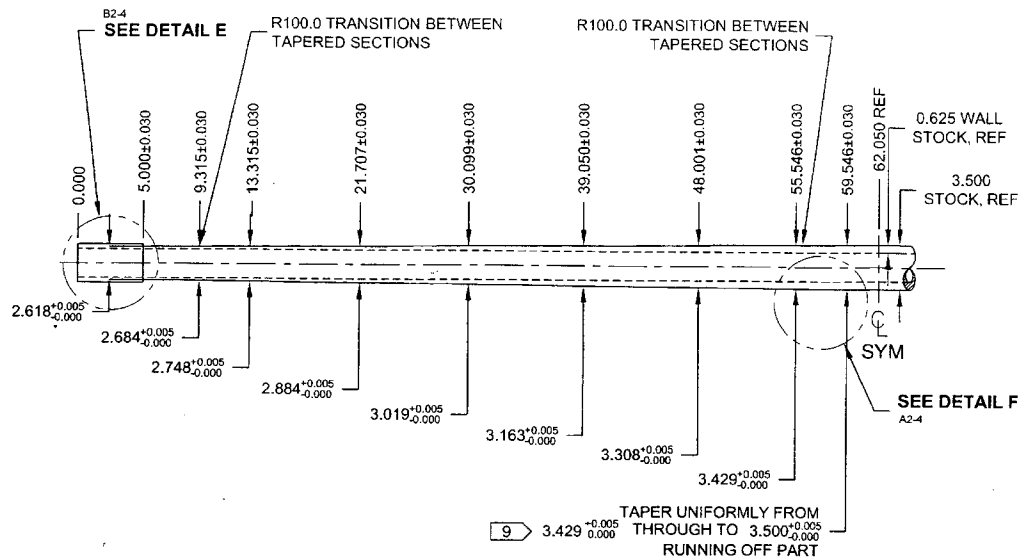


**D412-664-603** 10  
**BENDING AND DRILLING DETAIL** E



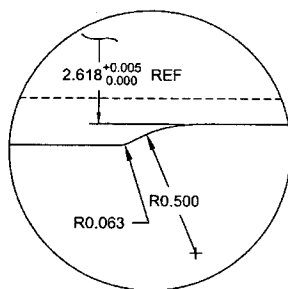
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 RELEASED  
 2009-10-29  
 MP

|            |          |  |              |
|------------|----------|--|--------------|
| DESIGN     | PH       | <b>DART AEROSPACE LTD</b>  |              |
| DRAWN      | RF       | HAWKESBURY, ONTARIO, CANADA  |              |
| CHECKED    | PS       | DRAWING NO.  | REV. E       |
| MFG. APPR. | PS       | D412-664-243   | SHEET 3 OF 4 |
| APPROVED   | MP       | TITLE  | SCALE        |
| DE APPR.   | MP       | CROSSTUBE ASSEMBLY (412 HI AFT)  | NTS          |
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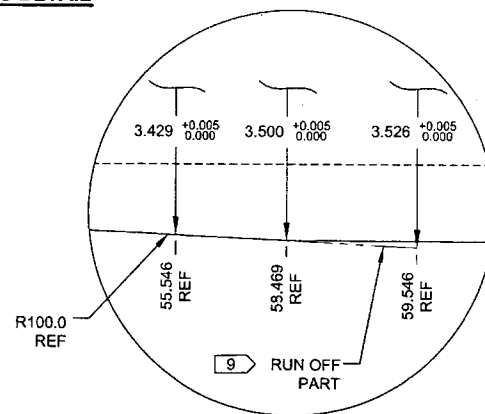


DETAIL E:  
CROSSTUBE CUFF D8-4  
SCALE 5X

D412-664-243TRN  
TURNING DETAIL



DETAIL G:  
CUFF TRANSITION C2-4  
SCALE 10X



DETAIL F:  
TAPER RUN-OFF C4-4  
NOT TO SCALE

2 DEO ATTACHED

RELEASED

2009-10-29

|   |          |  |              |
|---|----------|--|--------------|
| DESIGN  | PH       | DART AEROSPACE LTD                     |              |
| DRAWN   | RF       | HAWKESBURY, ONTARIO, CANADA            |              |
| CHECKED   | Q        | DRAWING NO.                            | REV. E       |
| MFG. APPR.  | 10       | D412-664-243                           | SHEET 4 OF 4 |
| APPROVED  | 10       | TITLE                                  | SCALE        |
| DE APPR.  | 10       | CROSSTUBE ASSEMBLY (412 HI AFT)        | NTS          |
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|                             |  |                     |   |  |                                |                           |              |
|-----------------------------|--|---------------------|---|--|--------------------------------|---------------------------|--------------|
| DRAWING NO.<br>D412-664-243 | TITLE<br>CROSSTUBE ASSEMBLY (412 HI AFT) | REV. E              | DART AEROSPACE LTD<br>ENGINEERING ORDER |  | D.E.O. NO.<br>D412-664-243-E-1 | SHEET NO.<br>SHEET 1 OF 2 | SCALE<br>NTS |
| DRAWN                       | CHECKED <i>MP</i>                        | MFG. APPR. <i>E</i> | APPROVED <i>MP</i>                      |  | DE APPR. <i>MP</i>             |                           |              |
| DATE 11.03.31               | DATE 11/03/31                            | DATE 11.03.31       | DATE 11/03/31                           |  | DATE 11-03-31                  |                           |              |

**PURPOSE:**

REMOVED ABRASION STRIP IN FAVOR OF A THIN LAYER OF PROSEAL 890.

**CHANGE:**

PARTS LIST IS AMENDED AS FOLLOWS:

**IS:**

| Item | Qty<br>-243 | Part Number    | Description    |
|------|-------------|----------------|----------------|
| 6    | 0           | D2856-600-1009 | ABRASION STRIP |

**WAS:**

|   |   |                |                |
|---|---|----------------|----------------|
| 6 | 2 | D2856-600-1009 | ABRASION STRIP |
|---|---|----------------|----------------|

NOTES 2 AND 14, SHEET 1 ARE AMENDED AS FOLLOWS:

**IS:**

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (HATCHED AREA)  
PAINT OUTSIDE PER DART QSI 005 4.2  
AFTER PAINTING, APPLY CLEAR COAT ON HATCHED AREA
- 14) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1  
CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL  
PROSEALED D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF  
PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.

**WAS:**

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF  
CROSSTUBE PER QSI 035.

**RELEASED**  
2011-04-07  
*MP*

|                             |  |                               |   |                                |                           |              |
|-----------------------------|--|-------------------------------|---|--------------------------------|---------------------------|--------------|
| DRAWING NO.<br>D412-664-243 | TITLE<br>CROSSTUBE ASSEMBLY (412 HI AFT) | REV. E                        | DART AEROSPACE LTD<br>ENGINEERING ORDER | D.E.O. NO.<br>D412-664-243-E-1 | SHEET NO.<br>SHEET 2 OF 2 | SCALE<br>NTS |
| DRAWN <i>[Signature]</i>    | CHECKED <i>[Signature]</i>               | MFG. APPR. <i>[Signature]</i> | APPROVED <i>[Signature]</i>             | DE APPR. <i>[Signature]</i>    |                           |              |
| DATE 11.03.31               | DATE 11.03.31                            | DATE 11.03.31                 | DATE 11.03.31                           | DATE 11.03.31                  | DATE 11.03.31             |              |

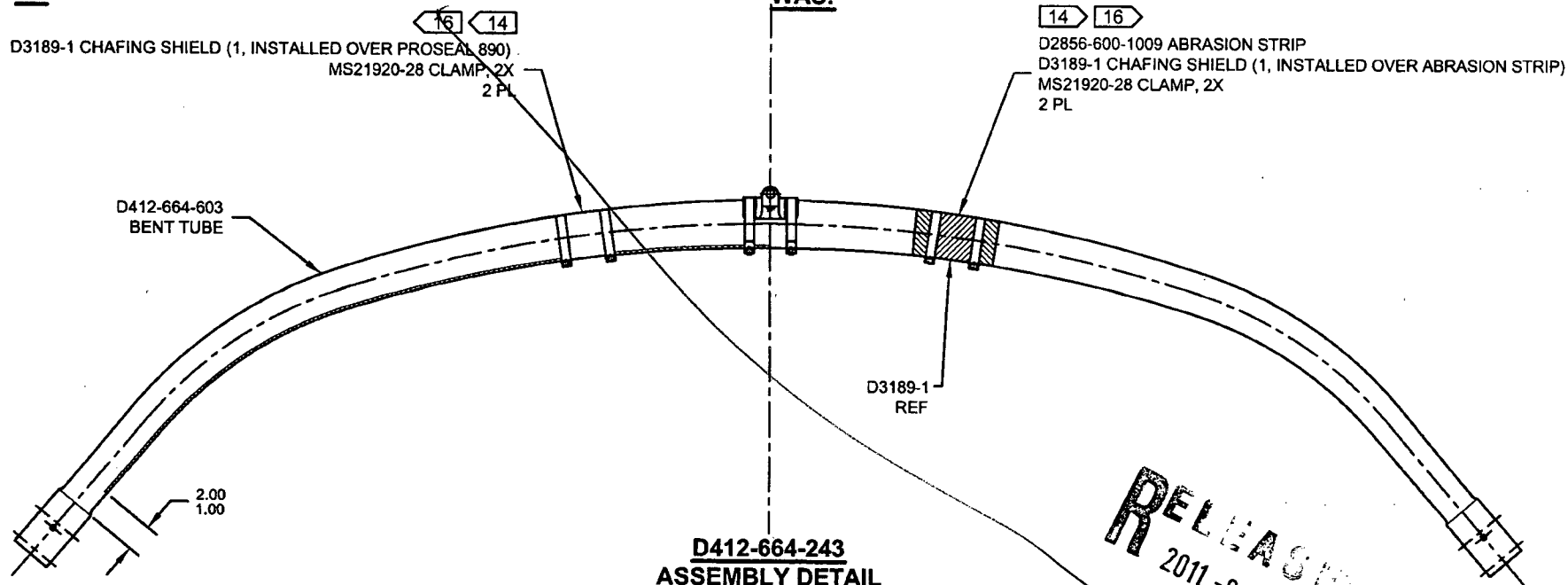
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**IS:**

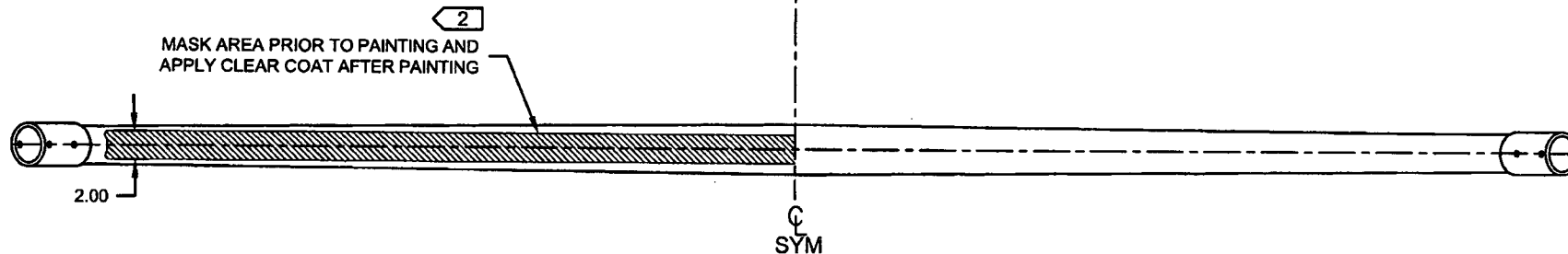
D3189-1 CHAFING SHIELD (1, INSTALLED OVER PROSEAL 890)  
MS21920-28 CLAMP, 2X  
2 PL

**WAS:**

D2856-600-1009 ABRASION STRIP  
D3189-1 CHAFING SHIELD (1, INSTALLED OVER ABRASION STRIP)  
MS21920-28 CLAMP, 2X  
2 PL



MASK AREA PRIOR TO PAINTING AND  
APPLY CLEAR COAT AFTER PAINTING



|                             |                                       |                  |   |  |                                |                           |              |
|-----------------------------|---------------------------------------|------------------|---|--|--------------------------------|---------------------------|--------------|
| DRAWING NO.<br>D412-664-243 | TITLE<br>CROSSTUBE ASS'Y (412 HI AFT) | REV. E           | DART AEROSPACE LTD<br>ENGINEERING ORDER |  | D.E.O. NO.<br>D412-664-243-E-2 | SHEET NO.<br>SHEET 1 OF 1 | SCALE<br>NTS |
| DRAWN<br>92                 | CHECKED<br>ASS                        | MFG. APPR.<br>ER | APPROVED<br>MP                          |  | DE APPR.<br>#                  |                           |              |
| DATE<br>11.09.07            | DATE<br>11.09.19                      | DATE<br>11.09.19 | DATE<br>11.09.19                        |  | DATE<br>11.09.19               |                           |              |

**PURPOSE:**

REPLACE MAGNOBOND WITH 3M DP460 SCOTCH-WELD EPOXY ADHESIVE

**CHANGE:**

IS:

| Item | Qty<br>-243 | Part Number       | Description                    |
|------|-------------|-------------------|--------------------------------|
| 9    | A/R         | SCOTCH-WELD DP460 | EPOXY ADHESIVE, 3M SCOTCH-WELD |

WAS:

|   |     |                |   |
|---|-----|----------------|---|
| 9 | A/R | MAGNOBOND 6398 | ROCKWELL SPECIFICATION RBO-120-023<br>ADHESIVE (TEXTRON/BELL SPEC. 299-947-100,<br>TYPE II, CLASS 2 ADHESIVE) |
|---|-----|----------------|---|

NOTE 12 & 16, SHEET 1 IS AMENDED AS FOLLOWS:

IS:

- 12) INSTALL D2896-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015. LET CURE FOR 24 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. **PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVE HAS CURED FOR 24 HOURS.**

WAS:

- 12) INSTALL D2896-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF D2896-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

**RELEASED**  
2011-09-29  
MP

|                             |  |                  |   |  |                                |                           |              |
|-----------------------------|--|------------------|---|--|--------------------------------|---------------------------|--------------|
| DRAWING NO.<br>D412-664-243 | TITLE<br>CROSSTUBE ASSEMBLY (412 HI AFT) | REV. E           | DART AEROSPACE LTD<br>ENGINEERING ORDER |  | D.E.O. NO.<br>D412-664-243-E-4 | SHEET NO.<br>SHEET 1 OF 3 | SCALE<br>NTS |
| DRAWN<br>92                 | CHECKED<br>A                             | MFG. APPR.<br>A  | APPROVED<br>MP                          |  | DE APPR.<br>MP                 |                           |              |
| DATE<br>12.08.21            | DATE<br>12.08.30                         | DATE<br>12.08.30 | DATE<br>12/8/30                         |  | DATE<br>12.08-30               |                           |              |

**PURPOSE:**

REMOVED ABRASION STRIP IN FAVOR OF A THIN LAYER OF PROSEAL 890. UPDATE INSTALLATION OF CHAFING SHIELDS AND REDUCE TORQUE TO 40-50 IN-LBS. THIS ENGINEERING ORDER SUPERCEDES DEO D412-664-243-E-1.

**CHANGE:**

**PARTS LIST IS AMENDED AS FOLLOWS:**

**IS:**

| Item | Qty<br>-243 | Part Number    | Description    |
|------|-------------|----------------|----------------|
| 6    | 0           | D2856-600-1009 | ABRASION STRIP |

**WAS:**

|   |   |                |                |
|---|---|----------------|----------------|
| 6 | 2 | D2856-600-1009 | ABRASION STRIP |
|---|---|----------------|----------------|

**NOTES 2, 14, AND 16 ON SHEET 1 ARE AMENDED AS FOLLOWS:**

**IS:**

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (HATCHED AREA)  
PAINT OUTSIDE PER DART QSI 005 4.2  
AFTER PAINTING, APPLY CLEAR COAT ON HATCHED AREA
- 14) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEALED D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- 16) TORQUE CLAMPS ON D2896-1 SUPPORT 80 TO 100 IN-LB. **TORQUE CLAMPS ON D3189-1 CHAFING SHIELD 40 TO 50 IN-LB.** ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

**WAS:**

- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 14) INSTALL D2856-600-1009 ABRASION STRIPS WITH A 0.13 REF GAP ON BOTTOM SIDE OF CROSSTUBE PER QSI 035.
- 16) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

RELEASED  
2012-09-04

MP

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |      |      |   |   |                      |   |                |              |   |  |  |
|--|------|------|---|---|----------------------|---|----------------|--------------|---|--|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____   |      |      |   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> |                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Crosstube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                |              |   |  |  |
| <b>Root Cause</b>  | Date | Step | Qty   | Description of work order update<br>or Non-conformance  | Initial<br>Chief Eng | Action<br>Description   | Sign &<br>Date | Verification | QC Inspector  |  |  |
| Doc/Data <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Equip/Tooling <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Operator <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Material <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Setup <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Other <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Process <input type="checkbox"/>   |      |      |   |   |                      |   |                |              |   |  |  |
| Supplier <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Training <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| Unapproved <input type="checkbox"/>  |      |      |   |   |                      |   |                |              |   |  |  |
| <b>FAULT CATEGORY</b>  |      |      |   |   |                      |   |                |              |   |  |  |
| <b>Landing Gear</b><br><input type="checkbox"/> Bending<br><input type="checkbox"/> Centre Not Concentric to O/S<br><input type="checkbox"/> Cracks<br><input type="checkbox"/> Crushed/Crimped.<br><input type="checkbox"/> Cuffs<br><input type="checkbox"/> Heat Treat<br><input type="checkbox"/> Inspection Strip in Tube<br><input type="checkbox"/> Ripples in Bend<br><input type="checkbox"/> Torque Waves in Extrusion<br><input type="checkbox"/> Turning Sequence<br><input type="checkbox"/> Wave/Twist in Tube |      |      | <b>General</b><br><input type="checkbox"/> Bend<br><input type="checkbox"/> BOM/Route<br><input type="checkbox"/> Broken/Damaged<br><input type="checkbox"/> Burrs<br><input type="checkbox"/> Contamination<br><input type="checkbox"/> Countersink<br><input type="checkbox"/> Cut Too Short<br><input type="checkbox"/> Drill Holes<br><input type="checkbox"/> Drawing<br><input type="checkbox"/> Finish<br><input type="checkbox"/> Folio |   |                      | <input type="checkbox"/> Grain<br><input type="checkbox"/> Hardware<br><input type="checkbox"/> Inspection Incomplete<br><input type="checkbox"/> Instructions Incomplete/Unclear<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> Mislabeled<br><input type="checkbox"/> Misread<br><input type="checkbox"/> Offset<br><input type="checkbox"/> Out of Calibration<br><input type="checkbox"/> Out of Sequence<br><input type="checkbox"/> Outside Dimensions   |                |              | <input type="checkbox"/> Ovalized<br><input type="checkbox"/> Over/Under tolerance<br><input type="checkbox"/> Part Incorrect<br><input type="checkbox"/> Part Lost/Missing<br><input type="checkbox"/> Part Moved<br><input type="checkbox"/> Positioned Wrong<br><input type="checkbox"/> Power Loss/Surge<br><br><input type="checkbox"/> Pressure/Forced<br><input type="checkbox"/> Temperature/Cure<br><input type="checkbox"/> Weld<br><input type="checkbox"/> Wrong Stock Pulled<br><br><input type="checkbox"/> Other |  |  |

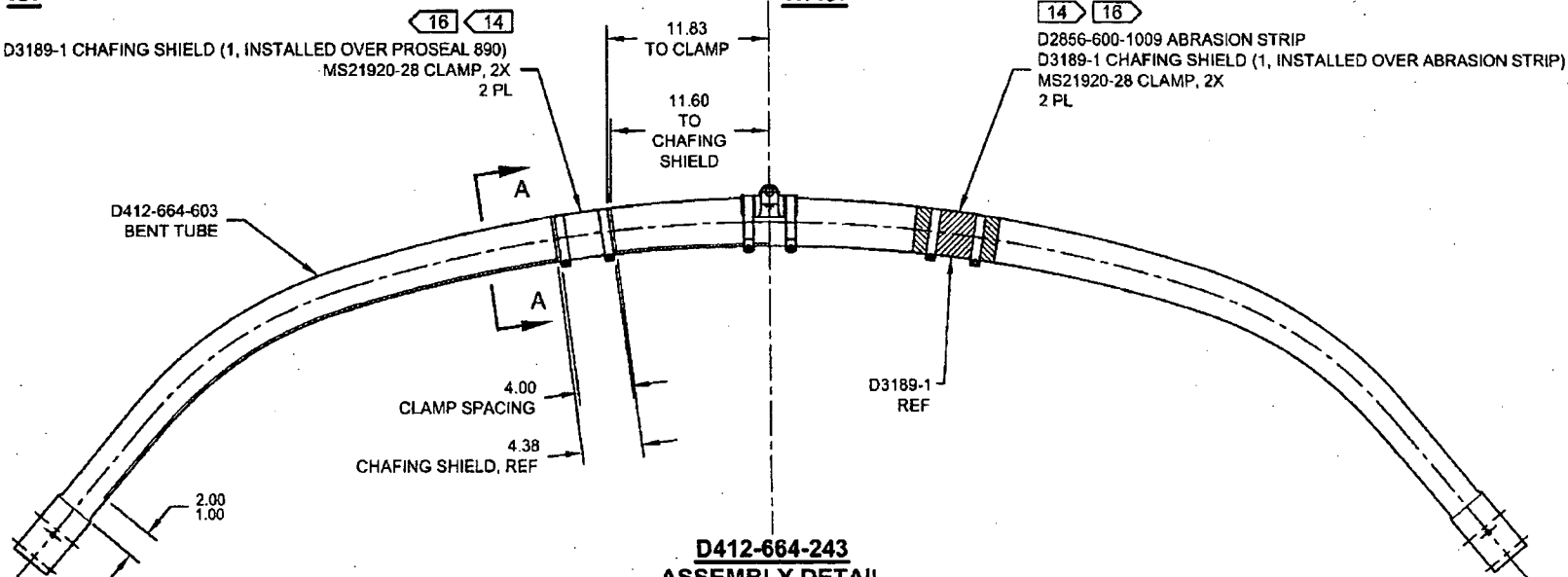


|                             |  |                  |   |                                |                           |              |
|-----------------------------|--|------------------|---|--------------------------------|---------------------------|--------------|
| DRAWING NO.<br>D412-664-243 | TITLE<br>CROSSTUBE ASSEMBLY (412 HI AFT) | REV. E           | DART AEROSPACE LTD<br>ENGINEERING ORDER | D.E.O. NO.<br>D412-664-243-E-4 | SHEET NO.<br>SHEET 2 OF 3 | SCALE<br>NTS |
| DRAWN<br>97                 | CHECKED                                  | MFG. APPR. AA    | APPROVED MP                             | DE APPR. <del>MP</del>         |                           |              |
| DATE<br>12.08.21            | DATE<br>12.08.27                         | DATE<br>12.08.29 | DATE<br>12.08.29                        | DATE<br>12.08.29               |                           |              |

**IS:**

D3189-1 CHAFING SHIELD (1, INSTALLED OVER PROSEAL 890)  
MS21920-28 CLAMP, 2X  
2 PL

D412-664-603  
BENT TUBE



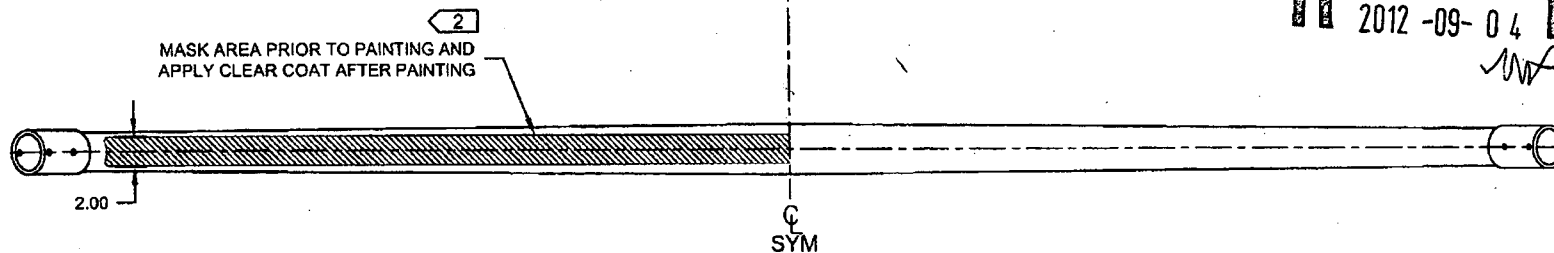
**WAS:**

D2856-600-1009 ABRASION STRIP  
D3189-1 CHAFING SHIELD (1, INSTALLED OVER ABRASION STRIP)  
MS21920-28 CLAMP, 2X  
2 PL

D3189-1  
REF

**D412-664-243  
ASSEMBLY DETAIL**

MASK AREA PRIOR TO PAINTING AND  
APPLY CLEAR COAT AFTER PAINTING



**RELEASED**  
2012-09-04

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WRITTEN PERMISSION FROM DART AEROSPACE LTD.

NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

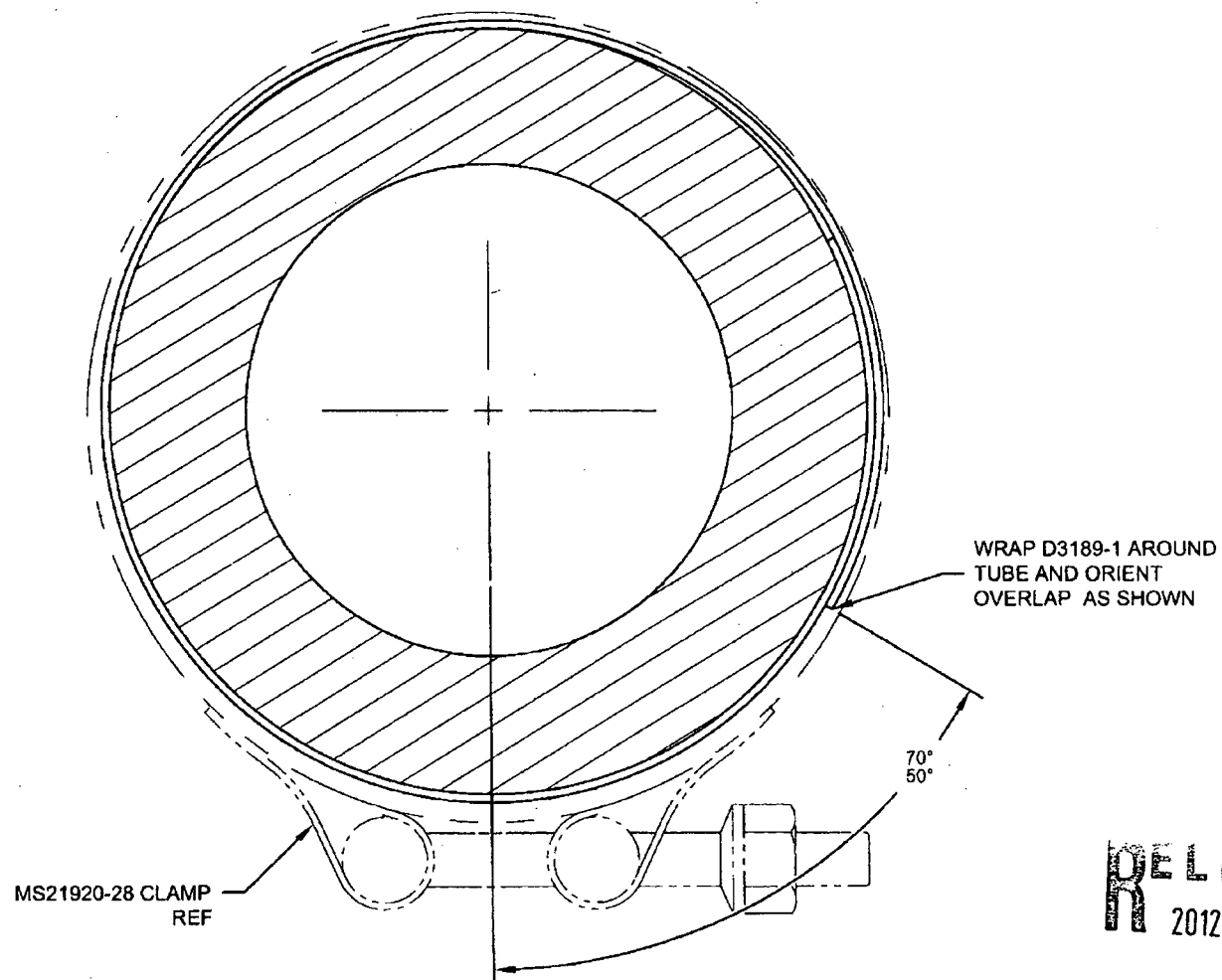
|  |   |   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
|--|---|---|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|----------------------------------|--|------------------------------------|--|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____ | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table> | Skid-tube <input type="checkbox"/>   | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> |  |
| Skid-tube <input type="checkbox"/>                           | Crosstube <input type="checkbox"/>  | Water Jet <input type="checkbox"/>  | Engineering <input type="checkbox"/> |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Machining <input type="checkbox"/>                           | Small Fab <input type="checkbox"/>  | Prod. Eng. Coord. <input type="checkbox"/>  | Quality <input type="checkbox"/>     |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Thermoforming <input type="checkbox"/>                       | Finishing <input type="checkbox"/>  | Rec/Store/Packaging <input type="checkbox"/>  | Other <input type="checkbox"/>       |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Large Fab <input type="checkbox"/>                           | Composite <input type="checkbox"/>  | Supplier <input type="checkbox"/>   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |

| Root Cause    | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector |
|---------------|------|------|-----|---|-------------------|--------------------|-------------|--------------|--------------|
| Doc/Data      |      |      |     |   |                   |                    |             |              |              |
| Equip/Tooling |      |      |     |   |                   |                    |             |              |              |
| Operator      |      |      |     |   |                   |                    |             |              |              |
| Material      |      |      |     |   |                   |                    |             |              |              |
| Setup         |      |      |     |   |                   |                    |             |              |              |
| Other         |      |      |     |   |                   |                    |             |              |              |
| Process       |      |      |     |   |                   |                    |             |              |              |
| Supplier      |      |      |     |   |                   |                    |             |              |              |
| Training      |      |      |     |   |                   |                    |             |              |              |
| Unapproved    |      |      |     |   |                   |                    |             |              |              |

**FAULT CATEGORY**

| Landing Gear  | General                                 | Other  |
|---|---|--|
| <input type="checkbox"/> Bending                      | <input type="checkbox"/> Bend           | <input type="checkbox"/> Grain                           |
| <input type="checkbox"/> Centre Not Concentric to O/S | <input type="checkbox"/> BOM/Route      | <input type="checkbox"/> Hardware                        |
| <input type="checkbox"/> Cracks                       | <input type="checkbox"/> Broken/Damaged | <input type="checkbox"/> Inspection Incomplete           |
| <input type="checkbox"/> Crushed/Crimped.             | <input type="checkbox"/> Burrs          | <input type="checkbox"/> Instructions Incomplete/Unclear |
| <input type="checkbox"/> Cuffs                        | <input type="checkbox"/> Contamination  | <input type="checkbox"/> Maintenance                     |
| <input type="checkbox"/> Heat Treat                   | <input type="checkbox"/> Countersink    | <input type="checkbox"/> Mislabeled                      |
| <input type="checkbox"/> Inspection Strip in Tube     | <input type="checkbox"/> Cut Too Short  | <input type="checkbox"/> Misread                         |
| <input type="checkbox"/> Ripples in Bend              | <input type="checkbox"/> Drill Holes    | <input type="checkbox"/> Offset                          |
| <input type="checkbox"/> Torque Waves in Extrusion    | <input type="checkbox"/> Drawing        | <input type="checkbox"/> Out of Calibration              |
| <input type="checkbox"/> Turning Sequence             | <input type="checkbox"/> Finish         | <input type="checkbox"/> Out of Sequence                 |
| <input type="checkbox"/> Wave/Twist in Tube           | <input type="checkbox"/> Folio          | <input type="checkbox"/> Outside Dimensions              |
|   |   | <input type="checkbox"/> Ovalized                        |
|   |   | <input type="checkbox"/> Over/Under tolerance            |
|   |   | <input type="checkbox"/> Part Incorrect                  |
|   |   | <input type="checkbox"/> Part Lost/Missing               |
|   |   | <input type="checkbox"/> Part Moved                      |
|   |   | <input type="checkbox"/> Positioned Wrong                |
|   |   | <input type="checkbox"/> Power Loss/Surge                |
|   |   | <input type="checkbox"/> Pressure/Forced                 |
|   |   | <input type="checkbox"/> Temperature/Cure                |
|   |   | <input type="checkbox"/> Weld                            |
|   |   | <input type="checkbox"/> Wrong Stock Pulled              |
|   |   | <input type="checkbox"/> Other                           |

|                             |  |                         |   |  |                                |                           |                  |
|-----------------------------|--|-------------------------|---|--|--------------------------------|---------------------------|------------------|
| DRAWING NO.<br>D412-664-243 | TITLE<br>CROSSTUBE ASSEMBLY (412 HI AFT) | REV. E                  | DART AEROSPACE LTD<br>ENGINEERING ORDER |  | D.E.O. NO.<br>D412-664-243-E-4 | SHEET NO.<br>SHEET 3 OF 3 | SCALE<br>NTS     |
| DRAWN<br><i>MD</i>          | CHECKED<br><i>MD</i>                     | MFG. APPR.<br><i>MD</i> | APPROVED<br><i>MD</i>                   |  | DE APPR.<br><i>MD</i>          |                           |                  |
| DATE<br>12.08.21            | DATE<br>12.08.27                         | DATE<br>12.08.27        | DATE<br>12.08.27                        |  | DATE<br>12.08.27               |                           | DATE<br>12.08.27 |



**SECTION A-A**  
CHAFING SHIELD DETAIL  
VIEW ROTATED, NOT TO SCALE

RELEASED  
2012-09-04  
*MD*

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NCR: Yes / No

**WORK ORDER NON-CONFORMANCE / UPDATE**

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

|  |   |   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
|--|---|---|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|----------------------------------|--|------------------------------------|--|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____ | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Work Order Update <input type="checkbox"/> | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table> | Skid-tube <input type="checkbox"/>   | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> |  |
| Skid-tube <input type="checkbox"/>                           | Crosstube <input type="checkbox"/>  | Water Jet <input type="checkbox"/>  | Engineering <input type="checkbox"/> |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Machining <input type="checkbox"/>                           | Small Fab <input type="checkbox"/>  | Prod. Eng. Coord. <input type="checkbox"/>  | Quality <input type="checkbox"/>     |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Thermoforming <input type="checkbox"/>                       | Finishing <input type="checkbox"/>  | Rec/Store/Packaging <input type="checkbox"/>  | Other <input type="checkbox"/>       |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |
| Large Fab <input type="checkbox"/>                           | Composite <input type="checkbox"/>  | Supplier <input type="checkbox"/>   |                                      |                                    |                                    |                                      |                                    |                                    |  |                                  |  |                                    |  |                                |                                    |                                    |                                   |  |

| Root Cause    | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector |
|---------------|------|------|-----|---|-------------------|--------------------|-------------|--------------|--------------|
| Doc/Data      |      |      |     |   |                   |                    |             |              |              |
| Equip/Tooling |      |      |     |   |                   |                    |             |              |              |
| Operator      |      |      |     |   |                   |                    |             |              |              |
| Material      |      |      |     |   |                   |                    |             |              |              |
| Setup         |      |      |     |   |                   |                    |             |              |              |
| Other         |      |      |     |   |                   |                    |             |              |              |
| Process       |      |      |     |   |                   |                    |             |              |              |
| Supplier      |      |      |     |   |                   |                    |             |              |              |
| Training      |      |      |     |   |                   |                    |             |              |              |
| Unapproved    |      |      |     |   |                   |                    |             |              |              |

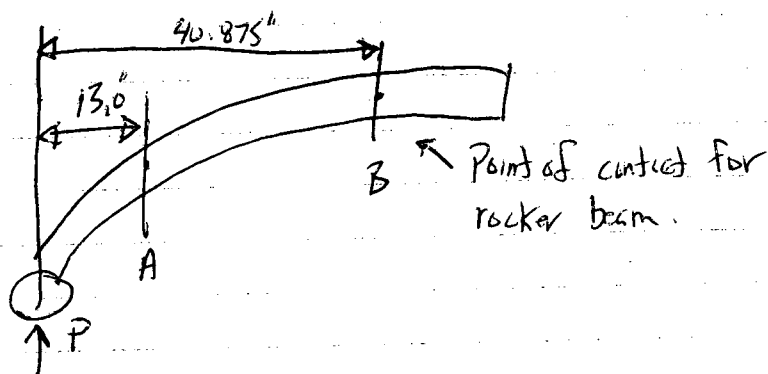
**FAULT CATEGORY**

| Landing Gear  | General                                 | Other  |
|---|---|--|
| <input type="checkbox"/> Bending                      | <input type="checkbox"/> Bend           | <input type="checkbox"/> Grain                           |
| <input type="checkbox"/> Centre Not Concentric to O/S | <input type="checkbox"/> BOM/Route      | <input type="checkbox"/> Hardware                        |
| <input type="checkbox"/> Cracks                       | <input type="checkbox"/> Broken/Damaged | <input type="checkbox"/> Inspection Incomplete           |
| <input type="checkbox"/> Crushed/Crimped.             | <input type="checkbox"/> Burrs          | <input type="checkbox"/> Instructions Incomplete/Unclear |
| <input type="checkbox"/> Cuffs                        | <input type="checkbox"/> Contamination  | <input type="checkbox"/> Maintenance                     |
| <input type="checkbox"/> Heat Treat                   | <input type="checkbox"/> Countersink    | <input type="checkbox"/> Misabeled                       |
| <input type="checkbox"/> Inspection Strip in Tube     | <input type="checkbox"/> Cut Too Short  | <input type="checkbox"/> Misread                         |
| <input type="checkbox"/> Ripples in Bend              | <input type="checkbox"/> Drill Holes    | <input type="checkbox"/> Offset                          |
| <input type="checkbox"/> Torque Waves in Extrusion    | <input type="checkbox"/> Drawing        | <input type="checkbox"/> Out of Calibration              |
| <input type="checkbox"/> Turning Sequence             | <input type="checkbox"/> Finish         | <input type="checkbox"/> Out of Sequence                 |
| <input type="checkbox"/> Wave/Twist in Tube           | <input type="checkbox"/> Folio          | <input type="checkbox"/> Outside Dimensions              |
|   |   | <input type="checkbox"/> Ovalized                        |
|   |   | <input type="checkbox"/> Over/Under tolerance            |
|   |   | <input type="checkbox"/> Part Incorrect                  |
|   |   | <input type="checkbox"/> Part Lost/Missing               |
|   |   | <input type="checkbox"/> Part Moved                      |
|   |   | <input type="checkbox"/> Positioned Wrong                |
|   |   | <input type="checkbox"/> Power Loss/Surge                |
|   |   | <input type="checkbox"/> Pressure/Forced                 |
|   |   | <input type="checkbox"/> Temperature/Cure                |
|   |   | <input type="checkbox"/> Weld                            |
|   |   | <input type="checkbox"/> Wrong Stock Pulled              |
|   |   | <input type="checkbox"/> Other                           |

11.12.06

CRUSHING OF D412-664-243

Acceptability of 8% CRUSHING AT END OF BEND



Point A:  $OD_1 = 2.961$ ,  $OD_2 = 2.522$   
 $CRUSHING = (2.961 - 2.522) / (2.961 + 2.522) = 8\%$   
 $I = 1.676 \text{ in}^4$  (from AutoCAD)

Point B:  $OD_1 = 3.307$ ,  $I = 4.613 \text{ in}^4$

A:  $F = M_c / I = P \times 13 \times 2.961 / 2 \times 1.676 = 11.484 \cdot P$   
 B:  $" = P \times 40.875 \times 3.307 / 2 \times 4.613 = 14.651 \cdot P$

M.S. =  $14.651 / 11.484 - 1 = 0.27$

∴ Tube will break at rocker beam contact before area of 8% crushing, 8% crushing in area at end of tube bend is acceptable.

GP 11.12.06





# LIQUID PENETRANT TEST REPORT

P- 12199

CLIENT Dart Aero Space DATE Oct 9/12 PAGE 1 OF 1  
ATTENTION MAT. ACUREN JOB No. 188-12-C0372  
ADDRESS 1270 ABANDON ST PO/NO No. 1180911  
HANKSBURY, ON. WORK LOCATION same  
PROJECT FPI CROSS TUBES, MACHINED PARTS ACCEPTANCE STD ASST 1417/051-038 REV./DATE 2005  
ITEM(S) EXAMINED (4)

JOB DESCRIPTION SEE RESULTS PROCEDURE NO. LT 0002 REV./DATE 2008 TECHNIQUE NO. LT 1042 REV./DATE 2008  
PART No. SEE RESULTS MATERIAL Acuren Acuren THICKNESS Various  
SCOPE A wet fluorescent liquid penetrant examination on the 100% of the surface was expanded

TEST DETAILS  
METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
FAMILY BRAND MAGNA FLUX BLACK LIGHT S/N 16459 ☐ OUTPUT > 1000  $\mu$ W/cm<sup>2</sup> ☐ AMBIENT < 2 fc  
PENETRANT 2607 MINIMUM DWELL TIME 45 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
PENETRANT REMOVER N20 MINIMUM DRY TIME >10 MIN. OTHER LAPING  
DEVELOPER SK052 MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N 1048866 CAL DUE DATE 11-24-2012  
DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☒ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/ 20°F ☐ -4°C/ 20°F TO 10°C/50°F ☒ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

| RESULTS- ( <input type="checkbox"/> METRIC <input type="checkbox"/> IMPERIAL ) |               | ACCEPT | REJECT |
|--|---------------|--------|--------|
| ITEM   | COMMENTS      |        |        |
|  | CROSSTUBES    |        |        |
| 1  | 89182         | ✓      |        |
| 1  | 89184         | ✓      |        |
| 1  | 89183         | ✓      |        |
| 1  | 89185         | ✓      |        |
| 4  | RAPPEL 90100  | ✓      |        |
| 2  | FORKEND 89613 | ✓      |        |

Scope of Services  
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.  
Standard of Care  
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES  
CLIENT REPRESENTATIVE Matthew Murdoch DTR # E-120594  
TECHNICIAN (SIGNATURE): Mike Thorsen REPORT REVIEWED BY:  
NAME (PRINT): 1<sup>st</sup> TECHNICIAN NAME INITIALS  
CGSB LEVEL II SNT LEVEL II CGSB LEVEL II SNT LEVEL II  
CGSB REG. No. 6606 CGSB REG. No. 6606

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## 5.0 PARTS LIST

## REFERENCE ONLY

## 5.1 HIGH GEAR CROSSTUBES

| Item | -101 | -201 | -203 | Part Number     | Description  |
|------|------|------|------|-----------------|--|
|      | X    |      |      | D212-664-101    | CROSSTUBE INSTALLATION, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD |
|      |      | X    |      | D212-664-201    | CROSSTUBE INSTALLATION, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT     |
|      |      |      | X    | D412-664-203    | CROSSTUBE INSTALLATION, 412 HIGH AFT   |
| 1    | 1    |      |      | D212-664-141    | CROSSTUBE ASSEMBLY, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD     |
| 2    |      | 1    |      | D212-664-241    | CROSSTUBE ASSEMBLY, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT         |
| 3    |      |      | 1    | D412-664-243    | CROSSTUBE ASSEMBLY, 412 HIGH AFT   |
| 10   | 2    |      |      | * D2893-1       | SUPPORT  |
| 11   | 4    |      |      | * D3595-063-450 | RUBBER CUSHION   |
| 12   | 4    |      |      | * MS21920-25    | CLAMP (OR MS21042-26)  |
| 13   | 4    |      |      | AN6-35A         | BOLT   |
| 14   | 4    |      |      | AN6-36A         | BOLT   |
| 15   | 6    |      |      | MS21042L6       | NUT (OR MS21042-6)   |
| 16   | 18   |      |      | AN960JD616      | WASHER   |
| 20   |      | 2    |      | * D2940-1       | SUPPORT  |
| 21   |      | 4    |      | * D3595-063-530 | RUBBER CUSHION   |
| 22   |      | 4    |      | * MS21920-28    | CLAMP (OR MS21042-30)  |
| 23   |      | 4    |      | AN6-40A         | BOLT   |
| 24   |      | 2    |      | AN6-41A         | BOLT   |
| 25   |      | 6    |      | MS21042L6       | NUT (OR MS21042-6)   |
| 26   |      | 18   |      | AN960JD616      | WASHER   |
| 30   |      |      | 1    | * D2896-1       | SUPPORT  |
| 32   |      |      | 2    | * D3595-063-570 | RUBBER CUSHION   |
| 33   |      |      | 4    | * MS21920-28    | CLAMP  |
| 34   |      |      | 2    | * MS21920-30    | CLAMP (OR MS21042-32)  |
| 35   |      |      | 4    | AN6-40A         | BOLT   |
| 36   |      |      | 2    | AN6-41A         | BOLT   |
| 37   |      |      | 6    | MS21042L6       | NUT (OR MS21042-6)   |
| 38   |      |      | 18   | AN960JD616      | WASHER   |
| 39   |      |      | 2    | * D3189-1       | CHAFING SHIELD   |
| 50   | 1    | 1    |      | D3428-1         | PLACARD  |

\*REFERENCE ONLY. PARTS ARE INCLUDED IN D212-664-141/-241 OR D412-664-243 ASSEMBLIES ABOVE  
 NOTE: KITS INCLUDE EXTRA HARDWARE FOR COMPATIBILITY WITH BOTH DART AND BELL/AAI SKIDTUBES.

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